ENHANCED 9-1-1 SERVICE

When a 9-1-1 call is placed from a fixed (wireline) location, such as a residential, coin or PBX type phone, the call is directed from the local telephone central office to one of the three New Jersey 9-1-1 tandem switches. Once received at the 9-1-1 tandem switch, an interrogation is made on the ANI, which allows the call to be selectively routed to the appropriate PSAP as follows:

CONVENTIONAL PSAP: The call is immediately directed to the appropriate PSAP as determined by the ANI. When answered, equipment at the PSAP interrogates the 9-1-1 database over a separate dedicated trunk. The database contains the subscriber's address information as well as the emergency Police, Fire and, EMS services for that exact location. This information when received, is then displayed on the call-taker's screen.

INTEGRATED PSAP: When it has been determined that the call is to be answered by a Integrated PSAP (IPSAP), the 9-1-1 tandem switch performs the database interrogation prior to sending the call to the IPSAP. Once the interrogation is complete, the call is transmitted to the appropriate IPSAP. When answered at the IPSAP the subscriber's address information as well as the emergency Police, Fire and, EMS services for that exact location are displayed on the call-taker's screen, prior to being connected to the caller.

When 9-1-1 calls are placed from these fixed locations, the network has the ability to direct the calls appropriately, based on information contained in the database.

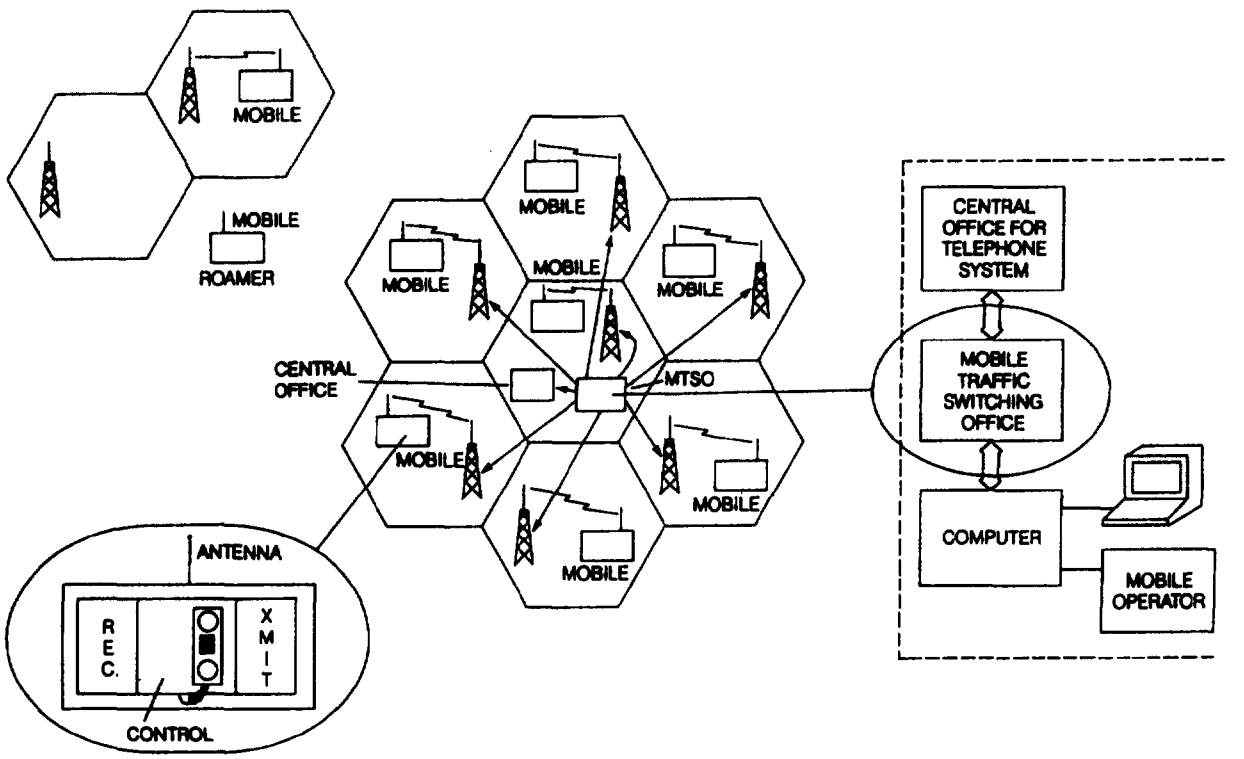
Until technology is developed and implemented into the New Jersey 9-1-1 network, calls placed from cellular phones do not have the same ability to be directed to the appropriate PSAP based on the location of the caller. Currently, the only accurate piece of information available to route calls is the location of the cellsite that received the 9-1-1 call. While this is not enough information to determine the exact location of the caller, in many areas of the state it allows the calls to be directed to the most appropriate PSAP, based on the coverage area as designed by the cellular company. Once answered at the PSAP, further interrogation will be made by call-takers most familiar with that general region.

CELLULAR TELEPHONE TECHNOLOGY

While it is not necessary for 9-1-1 call-takers to know every detail of cellular technology, it is important that they understand the general concept of how cellular calls are processed.

The FCC has allocated a 25 MHz. spectrum for cellular use. This spectrum is divided into two 12.5 MHz. bands. One band is to be used by the non-wireline cellular provider, referred to as the "A side", the other band is used by the wireline cellular provider, referred to as "B side". All areas where cellular service is offered have two cellular providers, generating competition. In New Jersey, the wireline provider is Bell Atlantic Mobile Systems. Non-wireline providers throughout the state include Comcast, Metrophone, Ocean County Cellular, and others. A new provider of wireless communications in New Jersey, similar to cellular, is Nextel.

The basic concept in a cellular system is frequency reuse. This concept is implemented by employing a pattern of overlapping cells, each cell is viewed as a hexagon.



BASIC CELLULAR NETWORK

A cellular telephone system typically includes many cell sites throughout a region. The population density and the amount of cellular traffic determine the amount and size of cell sites throughout the region. In large cities there are typically fifty to more than one hundred cell sites, smaller cities may have fifteen to thirty cell sites. Based on design, cell sites are usually spaced anywhere from one-half of a mile to as much as twenty miles apart. Each cellsite generally comprises one or more antennas mounted on a triangular platform. These antenna platforms are placed on top of towers or large buildings, fifty to three hundred feet above the surrounding terrain. Cell sites utilizing the three antennas are sectorized, each antenna sector designed to cover a 120 degree area.

These cell sites are connected to a centrally located cellular switch, referred to as a Mobile Telephone Switching Office (MTSO). The MTSO is basically a telephone switching office as far as hardware is concerned, but it uses a substantial amount of additional equipment programmed for cellular control. It not only connects the system to the telephone network, but continuously monitors signal strength during a call, and switches the cellular phone from cell site to cell site when necessary as the unit moves. The MTSO also records call information for billing purposes.

Cell sites are arranged in clusters where each cellsite is assigned a separate set of channels. These channels can be re-used in each cluster, making frequency re-use possible. Each cell site has at least one control channel dedicated for signalling between the cell and the mobile unit. The remaining channels are for conversation. Ideally, the signal generated from each cellsite is strong enough to provide coverage within that cell, however not powerful enough to interfere with a cellsite in an adjacent cluster, utilizing the same channel.

The cellular telephone unit consists of a control unit, a transceiver, and appropriate antenna. All cellular telephones have the capability of receiving all of the 666 channels in the 800 MHz. range allocated for cellular use. Each cellular phone has it's own telephone number assigned, like any other telephone. Calling from a cellular is much like dialing any other phone, utilizing area codes and the number called.

When a cellular phone is turned on, it monitors data being transmitted on a control channel by the cell with the strongest signal. If the strength of the signal becomes weak as the cellular phone travels through the region, the unit searches for a channel with a stronger signal from another cell.

Once a cellular call has been originated, the process of monitoring signal strength continues, and the call may be handed off to another cell site as the vehicle travels down the highway, without the user knowing.

A cellular phone is capable of placing a call wherever cellular service is available, however there is usually an additional cost, called a roaming charge, for the call if it is outside of the cellular coverage plan they purchased. With this feature, someone who has purchased a cellular plan in Maine where they live, would be able to place a call from their cellular phone while traveling through New Jersey, and would have the ability to call 9-1-1 to report an emergency.

The ability of a cellular phone to receive a call when outside their cellular coverage area is not as easy as placing a call. Unless the subscriber has purchased an option that will track the movement of the cellular phone from system to system, a special number will need to be dialed, prior to the cellular phone number. This number is referred to as the "roamer access number", when dialed calls can be completed to subscribers outside their coverage area. If that individual from Maine calls 9-1-1 to report an emergency on the New Jersey Turnpike, between exit 2 & 3, and the call-taker obtains the caller's cellular phone number, to call that person back the call-taker would need to do the following:

1) Determine the correct roam access number for the cellular system that processed the 9-1-1 call. In the example above, the number most likely would be 609-658-7626, assuming the call was received on the Bell Atlantic Mobile System.

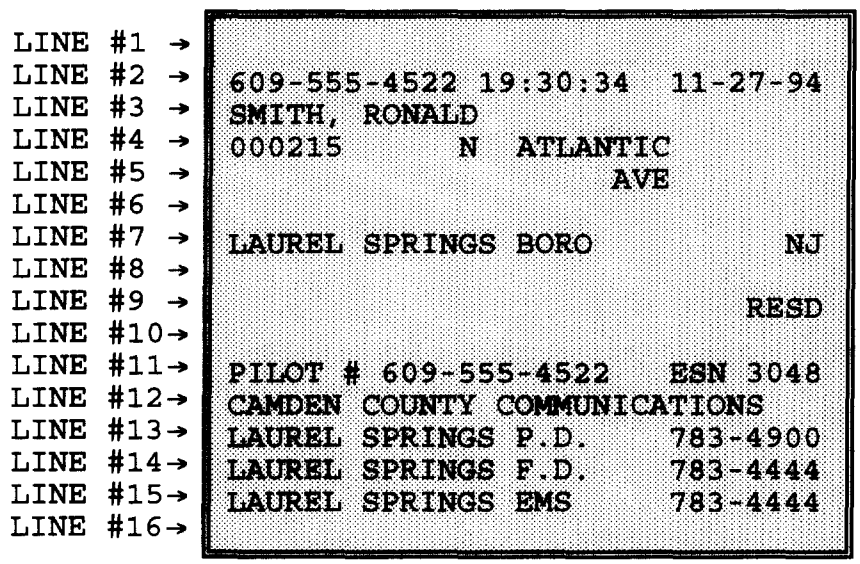
2) Dial the roam access number and wait for a second dial tone.

3) Dial the area code and the cellular phone number of the cell phone you are calling, do not dial "1" before the area code.

In a perfect environment, cellular calls would be received and processed by the cell site closest to the unit placing the call, this is not always the case. Due to excessive channel loading, and the nature of radio signal propagation, many times calls are processed by what would appear to be an inappropriate cell sites. This condition is frequently experienced resulting in 9-1-1 calls originating in Pennsylvania, Delaware, and New York being received at the NJSP locations.

ALI SCREEN FOR FIXED LOCATION 9-1-1 CALLS

Prior to discussing the format of the cellular 9-1-1 ALI screen this is a sample of the normal 9-1-1 screen.



TYPICAL RESIDENTIAL ALI SCREEN

LINE #1 BELL ATLANTIC WARNING MESSAGE
LINE #2 ANI(NPA, NXX, LINE), TIME, DATE
LINE #3 SUBSCRIBER NAME
LINE #4 ST #, ST NUMB TRAILER, ST NAME PREFIX, ST NAME
LINE #5 ST NAME(CONT), ST NAME SUFFIX, ST NAME TRAILER DIR
LINE #6 LOCALITY
LINE #7 MUNICIPALITY, STATE
LINE #8 BUILDING ID
LINE #9 UNIT IND, UNIT #, FLOOR IND, FLOOR #, CLASS OF SERVICE
LINE #10 BLANK LINE
LINE #11 PILOT NUMBER (MAIN BILLING NUMBER), ESN
LINE #12 NAME OF PSAP
LINE #13 NAME OF POLICE AGENCY, 7-DIGIT POLICE NUMBER
LINE #14 NAME OF FIRE AGENCY, 7-DIGIT FIRE NUMBER
LINE #15 NAME OF EMS AGENCY, 7-DIGIT EMS NUMBER
LINE #16 NETWORK WARNING LINE

SELECTIVE ROUTING OF CELLULAR 9-1-1 CALLS

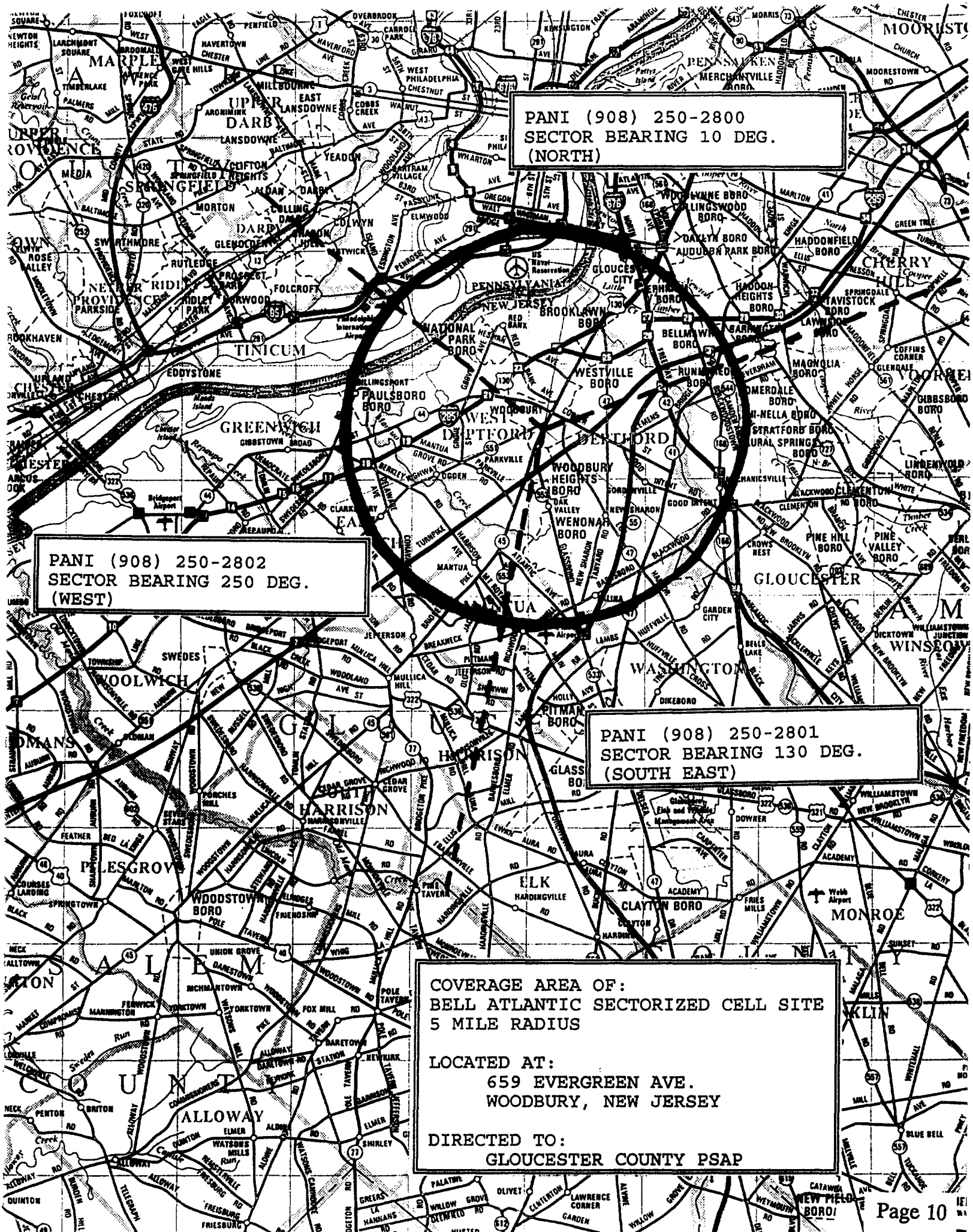
As discussed earlier, the present technology used in cellular 9-1-1 can not transmit the location of the cellular phone placing the call. In addition to not knowing the location, the subscriber's name can not be displayed on the ALI screen. When a 9-1-1 call is placed from a cellular phone, the call will enter the New Jersey 9-1-1 network and be selectively routed to the appropriate PSAP, as determined by the OETS. An evaluation of each cell site is made, based on the geographic location and coverage area, from information supplied by each cellular company.

Each cell site, or sector if the cell site is sectorized, is assigned a unique 7-digit telephone number, called the Pseudo Automatic Number Information (PANI). This number enables 9-1-1 calls received by that cell site, to be selectively routed to the PSAP as determined by OETS. These 7-digit number assignments all have the area code of 908 and, the NXX, (or exchange) of 250. The assignment of these numbers are coordinated between Bell Atlantic, the cellular providers, and OETS.

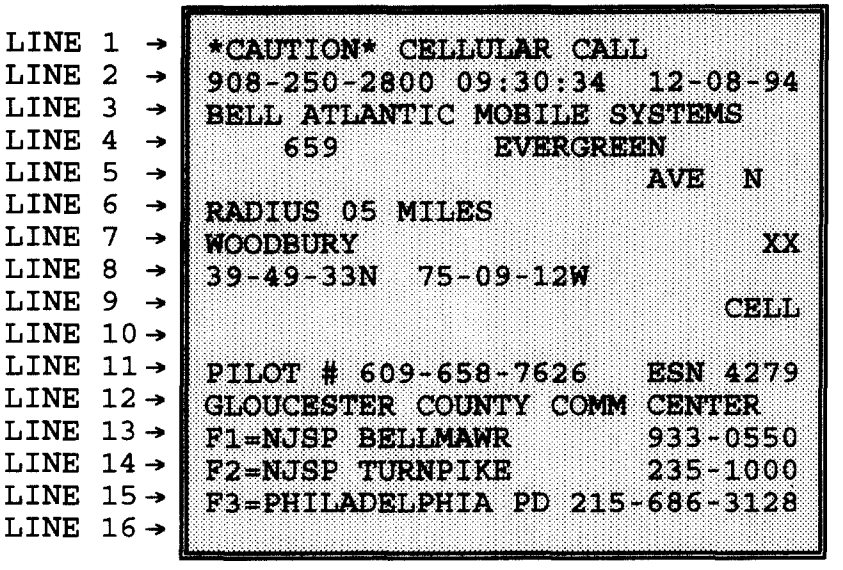
When a cellular 9-1-1 call is received at the PSAP, it must be understood by the call-taker that the information displayed on the ALI screen represents information about the cell site, not the caller. Information that will be displayed on the screen includes the name of the cellular company, location of the cell site, name of the PSAP, roamer access number, and possible transfers that may be needed. No information about the caller or their location will appear on the ALI screen.

To allow the 9-1-1 network to selectively route the cellular calls, each cell site, or cell site sector had to be assigned it's own unique emergency service number. In order to accomplish this, the database for cell sites had to be uniquely different from the existing database. The method used to separate the databases was the construction of a database using another state abbreviation, the abbreviation selected is XX. On the ALI screen, cellular calls will be from the state of XX, not NJ, don't consider this as an error and issue an inquiry form to correct it.

The map on page 10 represents the coverage area of a sectorized cell site in Gloucester County. Each sector has it's own PANI and Emergency Service Number (ESN) assigned. The sample ALI screen on page 12 represents a 9-1-1 call received from that cell site on the sector bearing 10 degrees, or the North.


PANI (908) 250-2800
SECTOR BEARING 10 DEG.
(NORTH)
PANI (908) 250-2802
SECTOR BEARING 250 DEG.
(WEST)
PANI (908) 250-2801
SECTOR BEARING 130 DEG.
(SOUTH EAST)
COVERAGE AREA OF:
BELL ATLANTIC SECTORIZED CELL SITE
5 MILE RADIUS
LOCATED AT:
659 EVERGREEN AVE.
WOODBURY, NEW JERSEY
DIRECTED TO:
GLOUCESTER COUNTY PSAP

ALI SCREEN FOR CELLULAR 9-1-1 CALLS



TYPICAL CELLULAR 9-1-1 SCREEN

A detailed description of each line of information is as follows:

LINE #1 Bell Atlantic warning message line. This line will alert the call-taker of the presence of an incoming cellular call. Cellular calls should indicate ***CAUTION* CELLULAR CALL**. This line will appear as inverse video or, in the case of a color monitor, a different color.

LINE #2 This line will display Pseudo ANI (refereed to as PANI in cellular), time and, date. The ANI that is displayed will indicate an area code of 908 in all cases, additionally the exchange, or NXX, will indicate 250 for all cellular calls. The line number (last 4 digits) will be the cell site or sector that it has been assigned to. Bell Atlantic has reserved this 250 dialing exchange for cellular purposes only.

LINE #3 This line will indicate the name of the cellular company that operates the cell site that received the call and processed it into the 9-1-1 network.

LINE #4 This line will be the actual address of the cell site processing the 9-1-1 call. This line will contain the street number, if one exists. The street number trailer and street name prefix will appear on this line if they exist. The street name will begin on this line and truncate to the next line if needed.

LINE #5 This line contains the street name, truncated from line 4, additionally the street name suffix and street name trailer directional will appear on this line. The street name trailer directional contains important information, relative to cellular calls. If a cell site has been sectorized the antenna bearing will be indicated in this field. If there is no trailer directional indicated the cell site is provides coverage in all directions and is not sectorized. In the sample screen, the trailer directional indicates that this particular sector is aimed towards the North.

LINE #6 This line will give the call-taker the coverage area that the cell site provides. This coverage area is listed in miles and may extend further than indicated, it is not an absolute.

LINE #7 This line indicates the municipality the cell site is located in. It also indicates the state of XX, as explained earlier.

LINE #8 This line lists the latitude and longitude coordinates of the cell site. If the PSAP wishes to plot the cell site on a mapping program, along with the coverage area it may assist the call-taker in narrowing down the location of the caller.

LINE #9 This line indicates the class of service, in this case CELL will be listed.

LINE #10 Blank line.

LINE #11 This line indicates the pilot number, however this number serves another purpose for cellular calls. For cellular calls the pilot number is actually the roamer access number that is to be used to call the caller back, if their cellular phone number was provided to the call-taker. This number is to be dialed prior to dialing the cellular number. The ESN will appear on this line also, each cell site has been assigned it' own ESN.

LINE #12 This line contains the name of the PSAP that OETS has determined the call should be directed to.

Lines 13, 14 and, 15 need special attention when dealing with cellular 9-1-1 calls. The function of the selective transfer buttons F1-Police, F2-Fire and, F3-EMS have been modified for cellular calls to assist the call-taker.

LINE #13 This line indicates the agency that the cellular call will be transferred to when the Police selective transfer button is pressed. Due to the nature of cellular calls, this button may represent an agency that the call-taker does not regularly transfer calls to, however, the PSAP may receive a cellular call from that jurisdiction. In the sample screen the F1 (Police) button will transfer the call to the New Jersey State Police, Bellmawr Station, who patrol Route 295 and Route 42 in the cell site coverage area.

LINE #14 This line indicates the agency that the cellular call will be transferred to when the Fire selective transfer button is pressed. Due to the nature of cellular calls, this button may represent an agency that the call-taker does not regularly transfer calls to, however, the PSAP may receive a cellular call from that jurisdiction. In the sample screen the F2 (Fire) button will transfer the call to the New Jersey State Police Turnpike dispatch since the Turnpike is within the cell site coverage area.

LINE #15 This line indicates the agency that the cellular call will be transferred to when the EMS selective transfer button is pressed. Due to the nature of cellular calls, this button may represent an agency that the call-taker does not regularly transfer calls to, however, the PSAP may receive a cellular call from that jurisdiction. In the sample screen the F3 (EMS) button will transfer the call to the Philadelphia Police Department since there is the possibility of calls from Philadelphia being received by this cell site.

When cellular calls are transferred via the selective transfer buttons, the call will be transferred over the 9-1-1 network and, if the agency has enhanced equipment will receive screen information also.

Each cell site will be evaluated by OETS and, similar modifications will be made to the selective transfer buttons. For example, in Salem County some buttons may be programmed for Delaware State Police and Chester Pa. Police. The northern part of the state may have New York State Police Departments where appropriate. The programming of these buttons will most likely be agencies not commonly utilized by that PSAP.

PSAP CONCERNS THAT NEED TO BE ADDRESSED

As OETS directs cellular 9-1-1 calls over the 9-1-1 network to the various PSAPs, several issues must be taken into consideration.

SPEED DIAL: PSAPs that receive cellular 9-1-1 calls must review their list of agencies programmed into their speed call list. A review of the coverage areas of the cell sites that are directed towards their PSAP should reveal agencies not currently included. Special consideration should be made in areas bordering other states. Areas near the coastal waterways should consider including the NJSP Marine Police and Coast Guard.

STAFFING: As indicated in the statistics compiled at the NJSP cellular PSAPs, there will be an additional call volume at PSAPs receiving cellular 9-1-1 calls. Additional time will be spent on determining the exact location of emergencies on these calls since ALI is not available. PSAPs can expect an increase in the number of calls received for each event, since many people passing the scene of an accident, fire, etc. will report the event. These calls are likely to continue until emergency vehicles arrive on the scene.

ABANDONED 9-1-1 CALLS: When abandoned 9-1-1 calls are received from cellular callers, the PSAP can not call the caller back. Additionally, dispatching police to investigate the abandoned call will be useless, since the address information will be relative to the cell site only. Call-takers need to be familiar with the 250 exchange on their abandoned call printer.

OUT OF STATE CELLULAR CALLS

To accommodate the processing of out of state cellular 9-1-1 calls, arrangements with Delaware, Pennsylvania and, New York have been made. The following procedures should be used in each state.

DELAWARE STATE:

Any call received for the City of Wilmington Delaware should be sent to Wilmington Police department at (302) 654-5151.

All other calls received from the state of Delaware should be sent to the Delaware State Police at (302) 573-2800.

PENNSYLVANIA:

Any call received for the City of Philadelphia should be sent to the Philadelphia Police Department at (215) 686-3128.

Any call received from Pennsylvania, south of Philadelphia should be sent to the Pennsylvania State Police at (215) 565-6500.

Any call received from Pennsylvania, north of Philadelphia, but south of Easton should be sent to the Pennsylvania State Police at (215) 493-4011.

Any call received from Pennsylvania, in or north of Easton, but south of the New York line, should be sent to the Pennsylvania State Police at (215) 588-0918.

NEW YORK STATE:

All calls received from New York State, with the exception of New York City and, the New York Thruway, should be sent to the New York State Police at (914) 783-6453.

All calls received from the New York Thruway should be sent to (914) 524-0200.

All calls received for New York City (all boroughs) should be sent to (212) 693-9911.

OETS CELLULAR 9-1-1 DATABASE INPUT FORM (SAMPLE)

CELLULAR COMPANY: BELL ATLANTIC MOBILE SYSTEMS COUNTY: GLOUCESTER

PSEUDO ANI: (908) 250-2800 MUNICIPALITY: WOODBURY

DIRECTED TO PSAP #	003
ESN ASSIGNED	4097
SELECTIVE TRANSFER KEY PROGRAMMING	
F-1 (POLICE)	609-933-0550
F-2 (FIRE)	609-235-1000
F-3 (EMS)	215-686-3128

ALTERNATE PSAP BY:	ESN X	PSAP
1st. ALTERNATE	PSAP #065, CAMDEN CO.	
2nd. ALTERNATE	PSAP #059, SALEM CO.	
3rd. ALTERNATE	609-589-0911	
4th. ALTERNATE		
5th. ALTERNATE		

SCREEN LINE CHARACTER POSITION (31 WIDE X 16 HIGH)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0																															
1																															
2	9	0	8	-	2	5	0	-	2	8	0	0																			
3	B	E	L	L		A	T	L	A	N	T	I	C		M	O	B	I	L	E		S	Y	S	T	E	M	S			
4				6	5	9										E	V	E	R	G	R	E	E	N							
5																								A	V	E			N		
6	R	A	D	I	U	S		0	5		M	I	L	E	S																
7	W	O	O	D	B	U	R	Y																						X	X
8	3	9	-	4	9	-	3	3	N			7	5	-	0	9	-	1	2	W											
9																												C	E	L	L
10																															
11	P	I	L	O	T		#		6	0	9	-	6	5	8	-	7	6	2	6				E	S	N		4	0	9	7
12	G	L	O	U	C	E	S	T	E	R		C	O	U	N	T	Y		C	O	M	M		C	E	N	T	E	R		
13	F	1	=	N	J	S	P		B	E	L	L	M	A	W	R								9	3	3	-	0	5	5	0
14	F	2	=	N	J	S	P		T	U	R	N	P	I	K	E								2	3	5	-	1	0	0	0
15	F	3	=	P	H	I	L	A	D	E	L	P	H	I	A		P	D		2	1	5	-	6	8	6	-	3	1	2	8
16																															

DATE	11/17/94	NEW FORM	X	REVISED FORM	

SCREEN.D13